

(November 18), seems, however, to indicate that the morning of the 15th was far richer in meteors, as the following extract indicates: "At that hour (Sunday, 3 a.m.), however, we looked out, and finding that a few stars were 'on the shoot,' began to watch for them. Till well after four o'clock there were not many visible; something like one every two or three minutes. By five o'clock they markedly increased, and from 5.15 to 5.45 there was quite a shower, and between these times we counted over sixty meteors. Once three 'came away' almost simultaneously, and another time two flashed out together. Nearly all of them were very small, and had very short and very swift flight, and many were scarcely more than just visible. There was one brilliant exception that shot out from the feet of the Twins, and disappeared near Orion's belt, that was of first magnitude, and left a red streak that remained for twelve or fifteen seconds afterwards. At six o'clock the meteors seemed almost suddenly to cease, and shortly afterwards our vigil came to an end."

M. PERROTIN, director of M. Bischoffsheim's private observatory at Nice, has resigned his post in order to become an observer at the Meudon Astro-physical Observatory.

MR. BALFOUR ON SCIENCE AND INDUSTRY.

MR. ARTHUR BALFOUR was the principal guest at the Cutlers' Feast at Sheffield last Thursday evening. In the course of his reply to the toast "Her Majesty's Ministers" he referred to scientific education in Germany, and the relations between science and manufacture. It is satisfactory to know that these subjects are now occupying the minds of our political leaders, and that such sound views should be expressed on the value of scientific research, and the true meaning of technical education, as those contained in the subjoined *Times*' report of Mr. Balfour's speech:—

"I think that, though we have not much to fear from the action of other nations, we have much to learn from the action of other nations. I have already said that I think John Bull requires the occasional stimulus of a panic to make him do his best. He is like a noble horse dragging a load, well within his weight, who perhaps gets a little slow in his action unless occasionally he hears the crack of the whip. I think that, though I do not envy the growth of German manufactures—taking Germany for example—though I neither envy the growth of German manufactures, nor fear the growth of German manufactures, though I do not think that German prosperity can be other than in the long run a help to British prosperity, still I am not so blind as to think, with regard to a nation which gives itself over with such fervour to everything which can by discipline and education promote its material prosperity, that we have nothing to learn by the study of its proceedings. I believe we have a good deal to learn, and I think it behoves us to learn it. Lord Rosebery desired that an inquiry should be made into the topics on which I am venturing to arrest your attention to-night. That inquiry is being made, or is partly being made, by the department of the Government concerned. I do not profess to give the results of these inquiries, but it is an undoubted fact that the Germans do think it, rightly or wrongly, to be worth while to spend money Imperially, municipally, and privately upon those branches of scientific research which have a direct bearing upon manufactures to an extent and degree absolutely unknown in this country, which surely ought to take the lead in all commercial matters. I have been informed by a gentleman who has recently come from an examination of these technical institutions in Germany that there are at this moment in Germany no fewer than six great technical institutions for the study of electrical matters alone, which are superior to anything of the kind which we have in this country. The witness of whom I speak was not a prejudiced witness. He went to Germany with no preconceived views either for or against the method of technical instruction there pursued, and I have faithfully detailed to you the information I gained. I am further informed, on evidence the value of which I cannot for a moment doubt, that, while the Government and the municipalities spend these vast sums in producing a great body of trained experts, the great manufacturers in Germany, to an extent altogether unknown in this country, employ a large body of investigators on their own account on their own premises, taking advantage of every discovery that can be made, and in so far as may be make

discoveries for themselves. I do not comment upon the fact; I simply state the fact to you. I should be reluctant to say how great is the advantage which any country thus liberally disposed is likely to reap. It may be that the Germans have been squandering their money in unremunerative investigation, and that they will not get in the shape of national profit any result for what they have done. That may be so, but I remember the late Mr. Bagehot's pointing out that one of the great advantages that England had over every other nation in the world was this—that when any discovery was made, when any new outlet of industry was invented, the amount of disposable English capital was so great that England reaped the chief benefit from it. Now this is the question I want to put. Is not Germany, by bringing into existence this vast body of fine specialists, preparing itself to make the utmost use of any possible advances in scientific manufactures which may be made? Is it not likely that it will have the advantage, as compared with other nations, in turning to account the smallest hint in any direction, in developing any discovery however slight, in making the most of any advance, however small that advance may be? That question I put to men incomparably more qualified to answer it than I am myself."

"But I think the question is worth putting in the great manufacturing centres of this country, and I would ask them not to be put off—I do not think Sheffield is likely to be put off—but I will ask any who read my words not to be put off with the idea that what is called technical instruction, by which I mean manual instruction in arts and crafts, however good in itself, has anything to do with the particular kind of education of which I am speaking. It has nothing to do with it. Education in the first three standards of your primary schools has more to do with the higher University training than the manual education of which I speak has to do with the technical education which I desire for the country. For the education in your primary schools is, after all, a necessary preliminary of your University education. You must learn to read, you must learn to write, you must learn to do arithmetic before you can take advantage of what Oxford and Cambridge, Edinburgh and Glasgow, have to give you, but still education in the three R's leads up to all this knowledge, but the manual education called technical does not lead up to and has no relation to or connection whatever with that scientific education of which I speak. England became a great manufacturing country, the greatest manufacturing country which the world has ever seen, before the intimate relation of organised science to manufactures was thoroughly understood. I fear that in some quarters it may still be a fact that the relation between science and manufactures is not thoroughly grasped, and there may still be some who think that money spent in what appears to be abstract investigations far removed from the practical things of life has but a small effect on national well-being and national commerce. If any hold that view, believe me, they are profoundly mistaken. They have not followed the course of human knowledge, they have not kept abreast of human progress, and if we have leeway to make up in this matter, if we have to learn a lesson which perhaps came easier to the Germans than it did to us, let us hasten, at all events, to learn that lesson completely, and then I doubt not we shall—even in the eyes of the most pessimistic critic—continue to hold that position which hitherto we have held unchallenged, and then British manufactures, British industry, British capital may still maintain throughout the world the supremacy they have so long held and so well deserved."

THE LONG PERIOD WEATHER FORECASTS OF INDIA.

IN days when the *cui bono* of everything connected with scientific research is subjected to the glare of criticism by a public which is frequently too busy to analyse or understand the laborious methods by which accurate knowledge is attained, the Meteorological Service of India poses as a happy exception to that of many other scientific departments in being able to demonstrate its practical utility by the success, not merely of its everyday routine forecasts, but by its unique initiation and development of seasonal or long-period forecasts of the alternate monsoons.

The foundations so carefully laid by the late Mr. Blanford, have enabled his successor, Mr. Eliot, to realise the expectations he so hopefully expressed years ago regarding the important rôle that India would play in the future development of meteorology.

Beginning with a few empirical sequences first suggested by Blanford, the principles on which the seasonal forecasts, issued semi-annually from the Simla Office, are now based, are every year becoming more rational and trustworthy, and recognising the immense practical service of such a system to the country, the Government have recently sanctioned the establishment of fresh observing stations in Persia, a cable to the Seychelles, and the continuation of the monsoonal charts of the Indian Ocean, which have already thrown considerable fresh light upon the conditions which regulate the normal and abnormal development of the weather characteristics of each monsoon in different years.

The exceptional feature possessed by India, in common with most tropical countries, and which renders it possible to deal with its weather in broad masses and for long periods, instead of by the hour or day, is the fact that the periodic or climatic changes are far more important than those irregular, aperiodic, and ephemeral fluctuations which in these latitudes constitute the dominant components of weather.

Thus, to quote a single example, when all the extreme diurnal changes of pressure at principal observatories in India are tabulated for a year in groups according to magnitude, it is found that 95 per cent. of them are less than those which are due to the regular hourly oscillation; and the same is true of similar changes in the other elements.

In brief, while daily weather anomalies and their prediction are the chief problem of the European forecaster, the relative unimportance of these in India, compared with the broad seasonal changes, or the variations of the average weather of a season from the normal (where each day resembles its predecessor so much that the effects of a certain type become cumulative, instead of being compensated by alternation), naturally leads the Indian forecaster to regard the elucidation of long-period variations, and their prediction, as the problem which should demand his principal attention.

Daily storm warnings may be of service to the shipping in the Indian ports, and round the coasts; but for everything relating to agriculture and internal land economy, seasonal forecasts are undeniably superior.

With a good telegraphic system, daily forecasting can proceed fairly successfully on purely empirical lines, not unlike those by which a railway signaller is able to announce the arrival of an approaching train. On the other hand, successful prediction of circumstances not already in progress, and dependent upon conditions related to the movements of large air currents over extensive areas, and occupying considerable periods of time—if at first provisionally approached by empirical sequences—will ultimately necessitate as much rational inquiry, explanation and deduction as science alone can supply. India thus demands, and, fortunately, has hitherto succeeded in securing, a service of forecasters possessed of higher scientific training, as well as practical skill, than probably any weather service in the world.

The preparation of the monsoon forecasts in India is based at present on three or four broad sequences, whose rational causes are as yet only partially understood. Coupled with these are a considerable amount of deduction from rational hypothesis, comparison with present and past conditions over surrounding areas, analogy with like conditions in previous years, and modification according to ascertained persistence of local anomalies.

The determining factors may be classed as (1) local, (2) general. The local factors, which were formerly considered the most important and, indeed, the dominant causes of the monsoon, have, of late years, and especially since the publication of Indian Ocean monsoon maps, been shown to be subordinate to, and of merely secondary importance compared with, those which evidently control the strength and quality of the monsoon current itself.

For the summer, or south-west monsoon, these local factors are:—

(a) The snowfall of the preceding cold weather, and (b) the local anomalies over India and adjacent seas during the ante-monsoon months shown in the monthly average anomaly maps. At one time the former of these was thought to be the key to the problem of drought or heavy rains over the whole country during the ensuing months, scanty rains being the sequel to heavy snow. Experience, however, has shown that, while heavy snowfall over the Himalaya, especially late in the season, as in April and May, exercises an important influence in delaying the arrival, and checking the advance, of the monsoon over those areas of Upper India which border on the hills where such excessive falls have occurred, the converse is not so effective, while

in any case the effects are liable to be counteracted by the intrusion over India of a monsoon current of more than ordinary strength. This latter is a circumstance which is regulated by influences connected with the circulatory system of the whole depth of atmosphere over an entire hemisphere, and, therefore, quite too large to be seriously modified by the local reactionary effects of a comparatively small snow-covered area.

Nevertheless, the reports of the winter snow-fall over the Himalaya are of considerable importance in estimating the complex probability of an early or late, favourable or unfavourable monsoon, and form one of the recognised official principles on which the final forecast is based in May.

The second factor (b), once thought to be all-powerful, and still of considerable importance in determining the average local and provincial variations of rainfall and weather during the prevalence of the monsoon, is estimated by the synoptic presentment of the temperature, and particularly the pressure anomalies exhibited in the monthly anomaly maps during the ante-monsoon or "hot-weather" period.

These anomalies are found to persist more or less throughout the entire period of the south-west monsoon, and indicate the lines or zones which are favoured or avoided by the cyclonic vortices which distribute the monsoon rains. As Mr. Blanford pointed out, in his classical memoir on the rainfall of India, they "rather indicate a dependence of the storm track on a quasi-persistent distribution of pressure than merely a modification of the average pressure distribution by the passage of the barometric depression accompanying the storm."

In fact they may be compared to the moulds into which molten metal is run, and which fashion its shape by guiding it into pre-existing channels and cavities.

The circumstances which determine the sudden bursting of the Indian monsoon in the first week of June, have recently been graphically described by Mr. Eliot in his paper on the character of the air movement on the Indian seas and equatorial belt during the south-west monsoon period, in the *Quarterly Journal of the Royal Meteorological Society* in January of the present year.

From a careful study of the Indian monsoon charts, and the barometric conditions over the equatorial region, it has been found that the northward advance of the sun, and the establishment of a thermal focus over the Indian land area, tends to weaken the northern side of the equatorial atmospheric crater which surrounds the ascensional terminus of the normal north and south-east trade-wind systems, and finally stop the ascensional outlet for the latter. Its consequent horizontal outflow northwards, like a pent-up lava stream, towards the newly-formed ascensional focus over the Indian land area, occurs during the last fortnight of May, in conjunction with a simultaneously sudden rise of pressure over the equator, and a consequent increase in the northward gradient.

This sudden transformation is, moreover, effected apparently more by actions tending to increase the high pressure south of the equator, due to the seasonal enlargement of the permanent south polar cyclone, than by any local actions over India or Southern Asia, though it is possible that the general conditions over the latter assist.

It is, therefore, to the South Indian oceanic area that the attention of the Indian forecasters of the monsoon is now directed, in order that they may have early intimation of the variations in the "vis a tergo."

As soon as the current reaches the Indian land area, it fills up the local inequalities in the pressure mould; and since by the principle of "courant ascendant" persistence, such local characteristics, once initiated, tend to continue, the forecaster is able to deduce, on the supposition of a normal, excessive, or weak monsoon (a distinction which can ordinarily be determined on its first appearance), the probable local deviations which form such a valuable practical part of the forecast. The results of these two local factors, together with those of a more subordinate character, are all liable to serious modification through the dominant influence of

(2) The general character and strength of the monsoon current.

It is now one of the accepted canons of Indian meteorology, which may be considered as due to the industry and perspicacity of its present high priest, that while the antecedent local anomalies over the Indian area, introduced by thermal conditions, modify the character of the current and control its local effects, they are in no sense, as was formerly believed

its proximate cause, and that the changes in its general strength and character from year to year are more the result of actions taking place south of the equator than of any peculiar conditions over the south Asiatic land area.

The extension of the area of observation, as far as Mauritius and the Seychelles, is the logical outcome of this principle; and though the information at present obtainable is mostly empirical in form, it is found that the essential subsequent unity of the south-east trade and the south-west monsoon enables early information of the character of the former in the southern seas to be used as an empirical index to the seasonal character of the latter as soon as continuity has been established across the equator.

A strong trade-wind argues *pari passu* a strong monsoon, and therefore a good rainy season over India, except where it is counteracted by opposing local factors.

It will probably be some time before rational knowledge of this important factor will supersede the empirical for the purposes of practical forecasting. Meanwhile every extension of the means of accelerating the transmission of news of south-east trade conditions is invaluable in forming a trustworthy seasonal forecast from the Simla Office.

The summer monsoon forecast is made up provisionally about the fourth week in May, and held over until symptoms of the coming monsoon manifest themselves in Bombay, in order to allow of the latest information being incorporated. June 6 or 7 is the average date for Bombay, and it is frequently from two to three weeks later before it reaches the Punjab.

The work of preparation is no light matter, since the greatest care is taken by Mr. Eliot to allow for every factor, and to arrive at a fair balance of probabilities.

It is a serious matter to forecast for six months over an area half as large as the United States, and the work occupies a week after every map and datum is on the table.

Two points on which the agricultural value of the monsoon rainfall largely depends are at present only partially predictable, viz.: (1) the probability of a prolonged break in the rains in July or August, and (2) the probability of an unusually early termination of the rains in Upper India or Bengal.

The former depends chiefly on the relative strength of the two branches of the monsoon current, the break generally occurring with a relatively weak Arabian Sea current, while the latter depends on the early establishment of the high pressure over North-west India and North Burmah, which causes the reversal of the gradient, and, as it were, drives the monsoon out of the Bay of Bengal.

These conditions can only be inferred months before their occurrence by analogy with previous years presenting similar characteristics.

Once they have started, however, they can be employed in determining the probability of the early or late occurrence of the rainfall of the winter monsoon.

The rainfall of this monsoon, though very inconsiderable compared with that of the summer, is, agriculturally speaking, of great value, since upon its presence the entire fortunes of the *rabi* crop depend.

Originating, as Mr. Eliot has so exhaustively shown in his recent "Memoir on the Winter Storms of India," in a lofty current 10,000 feet above sea-level, having no lower oceanic continuation, and shedding its vapour in storms bred on the plateaus of Afghanistan and Persia, it is at present impossible to obtain direct information of the character of the winter monsoon before its descent to the North Indian plains in December. A divining-rod has, however, been lately discovered, by which it may be inferred from the nature of the vertical pressure anomalies for the months immediately preceding December.

These anomalies represent the departure from the mean of the monthly mean pressure at stations near the foot of the hills, minus the corresponding departures at the mountain stations 7000 feet above. When the differences (plain minus hill stations) are positive, the inference is that the subsequent winter will be a dry and stormless one; if negative, precisely the reverse.

Since the character of the winter monsoon is found to be remarkably constant all through, probably because being an upper current it is unaffected by local and land influences, the forecast from this empirical sequence alone is found to be remarkably trustworthy.

There are some additional sequences, first indicated some years ago, which are useful in confirming the conclusions derived from the vertical anomalies, such as the probability of a light winter

fall succeeding a light and early departing monsoon, and *vice versa*. Such sequences are, however, really included under a more general law which, though at present empirical in form, appears likely to lead to a rational explanation of the chief yearly variations in both monsoons. This law is the outcome of a recent discussion, by Mr. Eliot, of certain oscillatory variations of pressure which are found to be common to the entire Indian oceanic and continental areas.

It has been found that the monthly mean barometric pressure of India is subject to a series of long-period waves of nearly equal amplitude, ranging up to as much as .07 inch (which is up to drought-producing power in India), and varying from twelve to twenty-four months in length. Twelve of these occurred in the last twenty years.

They are found to occur completely reversed in phase at Mauritius, and are considered to represent the major fluctuations in the annual oscillatory flow of air to and from the South Indian Ocean and India, in the form of the monsoons, together with similar conditions involved in the corresponding return flow in the upper and lower atmosphere, according as it is summer or winter. They are likewise precisely opposite in phase to the vertical anomalies. In other words, these oscillations of pressure represent compensatory variations in the horizontal transfer of air across the equator, and in the vertical transfers at the northern and southern termini of the circulatory system, which are intimately bound up with the strength and character of the monsoons.

The principal maxima pressures usually occur about the vernal, and the principal minima about the autumnal equinox. Employed as an empirical sequence for forecasting, the rule may be stated thus.

In years when the sea-level pressure anomaly is such that the curve is a descending slope during the spring months, the conclusion is that the south-west monsoon will be one of excessive rainfall, and *vice versa* when the slope is ascending, it will be comparatively dry. Conversely, the years of heavy winter rainfall during the north-east monsoon, tend to coincide with the maximum epochs of these pressure anomaly waves, *i.e.* with the minimum epochs of their vertical anomaly analogues, probably because diminished pressure above coincides with increased pressure below. *Vice versa*, years of light rainfall coincide with the epochs of general minimum anomaly at sea-level. By the accumulation of such sequences, and their gradual determination in a rational form, the science of long-period forecasting is being built up in India.

The occurrence of a severe scarcity during the present year is a timely commentary on the practical value and limits of the monsoon forecast.

Of the four causes detailed by Mr. Eliot in his paper on "Droughts and Famines in India," read before the Meteorological Congress at Chicago in 1893, the present famine is due to the last—viz. "Unusually early termination of the south-west monsoon rains. This is especially fatal in the case of rice crops on unirrigated land."

The same circumstance is also peculiarly prejudicial to the sowing of the winter or "*rabi*" grain crop which is reaped in March, especially when it is succeeded by scanty winter rains in December and January.

As has been already observed, this early termination of the south-west monsoon is one of the conditions which, at present, lies outside the conventional forecast, though it is rapidly becoming manifest that it is dependent on the general state of the south-east trade wind of the Indian Ocean. In the Forecast Circular issued this year by Mr. Eliot, and dated Simla, June 3, attention is drawn to the fact that, during the past two or three years, the "causes of the large variations of the rainfall in India have been evidently due to abnormal conditions outside the Indian area, and not to local peculiarities or abnormal meteorological features in India itself."

The anomalies are so remarkable that they are worth reproducing, as in the following table.

Years.	Rainfall anomaly from normal over India in inches.	Percentage variation from mean.
1893	+8.94	+22
1894	+6.48	+16
1895	-2.90	-7

The pre-monsoon conditions of temperature, pressure, and snowfall were almost identical in 1894 and 1895.

The south-east trade wind, however, was weak in 1895, and

the result was a deficient monsoon, which, moreover, terminated three weeks earlier than usual.

A similar weakness of the trades was visible, particularly at the Seychelles, this year. Hence, though Mr. Eliot was obliged to admit that the local conditions were favourable, he added a caution that "the inferences were to be accepted with greater reserve than usual."

The arena was ready for the gladiator if he arrived in good training, but the fight would depend on his strength. As events have shown, the gladiator monsoon was not "up to form," and the fight terminated a month earlier than usual all over Northern India and Burmah, with disastrous consequences to the kharif crop. It now remains to be seen whether the coming winter rains will be in defect or excess.

Until the end of the present month, when they can be inferred from the vertical anomalies of pressure, a provisional forecast can only be made on the law of sequences.

As a rule, "a light and early departing monsoon is followed by light winter rains." Consequently, so far, the outlook is serious. In such a case, however, by a similar law of sequence, the rainfall of next year's summer monsoon should be unusually heavy, so that the famine cannot continue for more than another six months. It is to be hoped that the omen may be averted, and that other factors may override the usual sequence and allow a good winter fall, which would, at all events, shorten the period of distress, and favourably modify, although it could not obviate the effects of the mischief done in September.

It would be impossible here to do more than cursorily advert to the moot question as to how far the periods of sunspot activity are directly related to the monsoons in a form in which they can be of practical utility in forecasting. *Pace* all that has been said to the contrary, there is no doubt that the condition of the sun introduces a long-period oscillation, probably of similar eleven-year period and small amplitude, into all the elements of Indian weather, modifying the epochal dates, and partially altering the character of the summer and winter rains; but year by year such a variation is too small, and too masked by others of larger amplitude, depending on changes of flow in the atmospheric currents of a less periodical and more rapid character, to admit of its entering as anything but a subordinate factor into the seasonal forecast. The attention of the department at present is so concentrated on these larger six-monthly and two-yearly oscillations, that it is unable to devote itself to the undoubtedly important task of determining the precise local value of the sunspot variation.

That this exists, however, even dominantly over the whole area, is plain from the following grouping of the yearly rainfall anomalies of the entire Indian area from 1864 to 1894, which shows that the total annual rainfall is slightly deficient about the epoch of sunspot minimum, and slightly excessive about the opposite epoch.

Groups of years.

Rainfall of India during the south-west monsoon. Anomaly from the mean smoothed figures.

Five years round year of minimum sunspot - 0.40 in.
Five years round year of maximum sunspot + 2.10 "

The relation to the sunspots is, however, greatly modified according to locality, being especially marked during the south-west monsoon over the Carnatic and Ceylon, and occurring in a reversed phase during the winter rains of North India. Symptoms of an early arrival of the monsoon in years of maximum, and late in years of minimum, have been noted; but the general statistical examination of the question on a rational basis is still a desideratum, and one which, given the necessary additional staff, Mr. Eliot considers of sufficient importance to claim the attention of the department.

At present his view of the matter, so far as its value in practical forecasting is concerned, may be stated thus.

After all the other factors have been considered, the position of the year in the sunspot cycle may be taken as an index of the steadiness or variability of its general characteristics. Thus, in years of maximum sunspot the monsoon is distributed more evenly, and local anomalies are less exaggerated. The years about the epoch of minimum are characterised by greater local contrasts and irregularities. A comparison of anomaly ranges with sunspots would thus repay investigation, and they might yet be shown to possess a value far in excess of that indicated by the small fluctuations visible in the combined averages over dissimilar areas.

DOUGLAS ARCHIBALD.

THE NEW RESEARCH LABORATORY OF THE ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH.

IN 1888 the Royal College of Physicians of Edinburgh determined to establish and equip a laboratory for original research. The scheme was regarded by the College as to a certain extent experimental, and was proceeded with cautiously. Instead of erecting special premises, an old house in Lauriston Lane was rented, close to the Royal Infirmary, and this was adapted and equipped at an outlay of 1000*l*. The success of the scheme soon became assured, and a large number of workers availed themselves of the opportunities afforded by the new laboratory for conducting investigations. The chief results of their work are set forth in five volumes of Laboratory Reports, and a sixth is now in course of preparation. A very important function of the Institution, moreover, has been the issuing of reports on morbid specimens sent to the Superintendent by practitioners. This work has gradually increased. While in 1890 only fifty reports were sent out, last year no less than 417 specimens were examined and reported on. In addition to these two primary objects of the Institution, the preparation of antitoxin serums has lately been undertaken at the instruction of the College.

The original building soon proved inadequate for the growing work of the laboratory, and the College being assured that the influence of its laboratory tended to the maintenance of the scientific spirit in medicine, directed its Committee to seek for a site on which to place a permanent institution. After many failures the College succeeded in acquiring a site and premises adapted to their wants, which has been purchased and equipped at a cost of about 10,000*l*.

The new laboratory, which was opened on November 6, is situated in Forrest Road, in the immediate vicinity of the Royal Infirmary, the University, and other medical schools.

In equipping these new premises, the objects kept in view were:—

(1) To provide a research laboratory in which bacteriological, histological, and chemical and experimental physiological and pathological work might be carried on.

(2) To make provision for examining and reporting on specimens sent by medical men.

(3) To provide a photographic department for macro- and micro-photography.

(4) To make suitable provision for carrying on the preparation of curative antitoxins, &c.

The fitting-up of the laboratory is in every respect most complete. Those portions of the building intended for laboratory work are heated by hot-water pipes, and are lighted by electricity. Hot water and steam for heating water baths are supplied throughout the building from a high-pressure-boiler; and in each department the supply of gas and water can be shut off without interfering with work in the other parts of the laboratory. Communications between the various rooms is by interchangeable telephones. To the right of the entrance is a large, well-lighted apartment, which will be used as the general office of the laboratory and for the examination of specimens. Opening off this apartment are two photographic rooms, the outer of which contains the micro-photographic apparatus and an arc lamp in a lantern, while the inner is the dark-room. On the left side of the entrance hall access is obtained to the Superintendent's room and the experimental apartment, the principal room on the ground floor, which is fitted up with the most modern apparatus and appliances for the carrying on of experimental work. In the old laboratory the recording gear was driven by water-power; in the new premises this work is done by two small electric motors placed beneath the floor. On the first flat, to the left of the landing, is the chemical room and a smaller room fitted with fume chambers. Provided with a working bench with places for six workers, the general chemical room is equipped in the most modern style. A through draught for the fume chamber is secured by a small fan driven by an electric motor. On the left of the landing, again, are large and small histological rooms and several apartments forming the bacteriological department. One of these rooms will be used for the production of the media for growing germs, and the production of diphtheria antitoxin. This department includes an incubating room.

The new laboratory, like the old, is freely open to those who desire to undertake original investigations in the medical